What is claimed is:

1. Providing a method of reducing dry-etch cleaning chamber particle count at the end of power-down for said dry-etch chamber, comprising:

providing a dry-etch cleaning chamber;

positioning a workpiece within said cleaning chamber; and

following a dry-etch chamber power-down procedure whereby said power-down is applied in a controlled and gradual manner.

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2. The method of claim 1 wherein said dry-etch chamber is of the Inductive Coupled Plasma variety said dry-etch chamber having a holding member with a surface which holds wafers or masks to be etched and an enclosing member which encloses the holding member to form a chamber for the plasma whereby plasma agitation occurs by an rf coil arrangement surrounding said enclosing member whereby said rf coil arrangement produces a large voltage change near the enclosing member thereby enabling the cleaning of the enclosing member by the plasma itself whereby furthermore plasma gasses can continuously be removed from said enclosing member by means of a suction pump arrangement attached to said enclosing member.

3. The method of claim 1 wherein said dry-etch cleaning chamber provides plasma gasses within the dry-etch cleaning chamber said providing to be followed by applying a RIE etch.

4. The method of claim 1 wherein said workpiece is a photolithography mask.

5. The method of claim 1 wherein said workpiece is the surface of a semiconductor substrate.

6. The method of claim 1 wherein said workpiece is any surface within the construction of a semiconductor device to which a dry-etch operation must be performed.

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~~7. The method of claim 1 wherein said following a dry-etch chamber power-down procedure is a power-down procedure whereby the rf power supplied to the ICP coil is gradually reduced in a sequence of six steps each of said six steps to be executed as part of a particular sequence and without time interruption each step immediately following the preceding step in numerical sequence whereby the time during which said RIE is applied varies and is adjusted in accordance with the step within the sequence wherein said steps are identified as step 1 through step 6.~~

8. The method of claim 7 wherein the processing conditions for said step 1 are specified as 30 mt/600 w ICP/15 w RIE/30 sccm O_2/2.5 min.

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9. The method of claim 7 wherein the processing conditions for said step 2 are specified as 30 mt/560 w ICP/15 w RIE/30 sccm O_2/30 sec.

10. The method of claim 7 wherein the processing conditions for said step 3 are specified as 30 mt/520 w ICP/15 w RIE/30 sccm O_2/30 sec.

11. The method of claim 7 wherein the processing conditions for said step 4 are specified as 30 mt/480 w ICP/15 w RIE/30 sccm O_2/30 sec.

12. The method of claim 7 wherein the processing conditions for said step 5 are specified as 30 mt/440 w ICP/15 w RIE/30 sccm O_2/30 sec.

13. The method of claim 7 wherein the processing conditions for said step 6 are specified as 30 mt/400 w ICP/15 w RIE/30 sccm O_2/30 sec.

14. The method of claim 7 wherein said six step power down procedure is modified to a sequence of N steps wherein N is a whole integer number other than zero and where the processing conditions for each of the consecutive steps are specified as 30 mt/AA w ICP/15 w RIE/30 sccm O_2/30 sec wherein said AA w ICP represents a value of applied power for the consecutive steps within said sequence said applied power to decrease concurrent with increases in the value of N and whereby said applied power varies from an initial high value to a final low value in incremental numbers whereby said incremental numbers may or may not be multiples of AA/N and whereby furthermore said initial high and final low values are experimentally determined and optimized for each dry-etch chamber power down procedure.

Sub A3 cont'd

15. The method of claim 1 wherein said following a dry-etch chamber power-down procedure is a power-down procedure whereby the rf power supplied to the ICP coil is reduced in a sequential and controlled manner during the elapsed time of the cleaning process of said dry-etch chamber whereby at all times during said elapsed time there is a one-to-one relationship between the rf power supplied to the ICP coil and the elapsed time of the cleaning cycle said relationship being defined by a specific mathematical equation where said equation may be different for different dry-cleaning cycles.

16. Providing a method of reducing particle count at the end of Power-down for a Inductive Coupled Plasma (ICP) dry-etch cleaning chamber, comprising:

providing a ICP dry-etch cleaning chamber;

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positioning a workpiece within said cleaning chamber; and

following a dry-etch chamber power-down procedure whereby said power-down is a six step power-down procedure whereby said six steps of said power-down procedure follow in a given numerical and fixed sequence and without interruption or time-lag in between any of said six steps and whereby step 1 is specified as 30 mt/600 w ICP/15 w RIE/30 sccm O_2/2.5 min. whereby further step 2 is specified as 30 mt/560 w ICP/15 w RIE/30 sccm O_2/30 sec. whereby further step 3 is specified as 30 mt/520 w ICP/15 w RIE/30 sccm O_2/30 sec. whereby further step 4 is specified as 30 mt/480 w ICP/15 w RIE/30 sccm O_2/30 sec. whereby further step 5 is specified as 30 mt/440 w ICP/15 w RIE/30 sccm O_2/30 whereby further step 6 is specified as 30 mt/400 w ICP/15 w RIE/30 sccm O_2/30 sec.

17. The method of claim 16 wherein said six step power down procedure is modified to a sequence of N steps wherein N is a whole integer number other than zero and where the processing conditions for each of the consecutive steps are specified as 30 mt/AA w ICP/15 w RIE/30 sccm O_2/30 sec wherein said AA w ICP

represents a value of applied power for the consecutive steps within said sequence said applied power to decrease concurrent with increases in the value of N and whereby said applied power varies from an initial high value to a final low value in incremental numbers whereby said incremental numbers may or may not be multiples of AA/N and whereby furthermore said initial high and final low values are experimentally determined and optimized for each dry-etch chamber power down procedure.

Sub A7 Contd

18. The method of claim 16 wherein said following a dry-etch chamber power-down procedure is a power-down procedure whereby the rf power supplied to the ICP coil is reduced in a sequential and controlled manner during the elapsed time of the cleaning process of said dry-etch chamber whereby at all times during said elapsed time there is a one-to-one relationship between the rf power supplied to the ICP coil and the elapsed time of the cleaning cycle said relationship being defined by a specific mathematical equation where said equation may be different for different dry-cleaning cycles.

19. The method of claim 16 wherein said dry-etch chamber having a holding member with a surface which holds wafers or masks to be etched and an enclosing member which encloses the holding member to form a chamber for the plasma whereby plasma

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~~agitation occurs by an rf coil arrangement surrounding said enclosing member whereby said rf coil arrangement produces a large voltage change near the enclosing member thereby enabling the cleaning of the enclosing member by the plasma itself whereby furthermore plasma gasses can continuously be removed from said enclosing member by means of a suction pump arrangement attached to said enclosing member.~~

20. The method of claim 16 wherein said workpiece is a photolithography mask.

21. The method of claim 16 wherein said workpiece is the surface of a semiconductor substrate.

22. The method of claim 16 wherein said workpiece is any surface within the construction of a semiconductor device to which a dry-etch operation must be performed.